

CLEAR VERSION OF THE SUBSTITUTE SPECIFICATION

SUBSTITUTE SPECIFICATION UNDER 37 CFR 1.125 (Clear Version):

IMAGE SENSOR MODULE HAVING LENS BARREL INTEGRALLY FORMED WITH HOLE AND POSITIONING SLOT AND METHOD FOR MANUFACTURING THE SAME

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BACKGROUND OF THE INVENTION

Field of the invention

The invention relates to an image sensor module and a method for manufacturing the same, and in particular to an image sensor module that can be
10 easily assembled, disassembled and effectively positioned.

Description of the related art

Referring to FIG. 1, a conventional image sensor module includes a lens holder 10, a lens barrel 20, and an image sensor 30. The lens holder 10 has an upper end face 12, a lower end face 14 and an opening 16 penetrating through the
15 lens holder 10 from the upper end face 12 to the lower end face 14. An internal thread 18 is formed on an inner wall of the opening 16 of the lens holder 10. The lens barrel 20 formed with an external thread 22 is inserted from the upper end face 12 of the lens holder 10, received within the opening 16, and screwed to the internal thread 18 of the lens holder 10. The lens barrel 20 is formed with a
20 transparent region 24 under which an aspheric lens 26 and an infrared filter 28 are arranged in sequence. The image sensor 30 has a substrate 31, which has a first surface 32 and a second surface 33 opposite to the first surface 32 on which a frame layer 36 is arranged. The first surface 32 is formed with first connection points 34. The second surface 33 is formed with second connection points 35. A
25 photosensitive chip 37 is mounted on the first surface 32 of the substrate 31 and electrically connected to the first connection points 34 by wires 38. A transparent layer 39 is adhered to the frame layer 36 to encapsulate the photosensitive chip 37 and the wires 38.

The image sensor 30 is bonded to the lower end face 14 of the lens holder 10 through the transparent layer 39. The screwed length between the lens barrel 20 and the lens holder 10 may be adjusted to control the distance from the aspheric lens 26 of the lens barrel 20 to the transparent layer 39 of the image sensor 30.

5 The above-mentioned image sensor module has the following drawbacks.

Because the aspheric lens 26 and the infrared filter 28 are bonded within the lens barrel 20, it cannot be easily assembled. Also, the aspheric lens 26 and the infrared filter 28 tend to be easily damaged.

It is an important subject of the invention to provide an image sensor module,
10 which can be easily assembled, disassembled, and effectively positioned.

SUMMARY OF THE INVENTION

An object of the invention is to provide an image sensor module for miniaturizing the product equipped therewith.

Another object of the invention is to provide an image sensor module capable
15 of being precisely positioned to facilitate the manufacturing processes.

To achieve the above-mentioned objects, the invention provides an image sensor module including an image sensor package, a lens holder and a lens barrel inserted. The lens holder is formed with a chamber and has an internal thread formed on an inner wall of the lens holder. The lens barrel is inserted into the
20 chamber of the lens holder, and formed with an external thread screwed to the internal thread of the lens holder. The lens barrel is further formed with an opening, a hole communicating with the opening, and a first positioning slot for directly positioning and holding an aspheric lens. The lens barrel is integrally formed with the opening, the hole and the first positioning slot, and
25 circumferential walls of the hole and the opening are made of the same material.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic illustration showing a conventional image sensor module.

FIG. 2 is a first schematic illustration showing an image sensor module of the
30 invention.

FIG. 3 is a second schematic illustration showing the image sensor module of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 2, an image sensor module of the invention includes an 5 image sensor package 40, a lens holder 42, and a lens barrel 44.

The image sensor package 40 includes a substrate 46, a frame layer 56, a photosensitive chip 60, and a transparent layer 64. The substrate 46 is formed with a top end face 48 on which first connection points 52 are formed, and a bottom end face 50 on which second connection points 54 are formed. The frame layer 56 10 is arranged on the top end face 48 of the substrate 46. A chamber 58 is defined between the substrate 46 and the frame layer 56. The photosensitive chip 60 is arranged within the chamber 58, and electrically connected to the first connection points 52 by wires 62. The transparent layer 64 is a piece of glass, which is adhered onto the frame layer 56 to encapsulate the photosensitive chip 60 and the 15 wires 62.

The lens holder 42 is formed with a chamber 66, and has an internal thread 68 formed on an inner wall of the lens holder 42 so that the transparent layer 64 of the image sensor package 40 is arranged under the lens holder 42.

The lens barrel 44 is inserted into the chamber 66 of the lens holder 42, and 20 is formed with an external thread 70, which is screwed to the internal thread 68 of the lens holder 42. The lens barrel 44 is further formed with an opening 72, a hole 74 communicating with the opening 72, a first positioning slot 80 for directly positioning and holding an aspheric lens 76, and a second positioning slot 82, disposed under the first positioning slot 80, for directly positioning and holding an 25 infrared filter 78. The lens barrel 44, the aspheric lens 76, and the infrared filter 78 are integrally formed by way of injection molding. Thus, the lens barrel 44 is integrally formed with the opening 72, the hole 74, the first positioning slot 80 and the second positioning slot 82, and circumferential walls of the hole 74 and the opening 72 are made of the same material. In this case, the second 30 positioning slot 82 has an annular upper surface 82A and an annular lower surface

82B facing the annular upper surface 82A.

A method for manufacturing the image sensor module of the present invention includes the following steps.

First, an image sensor package 40 is provided. The image sensor package 5 40 includes a substrate 46, a frame layer 56, a photosensitive chip 60, and a transparent layer 64. The substrate 46 is formed with a top end face 48 on which first connection points 52 are formed, and a bottom end face 50 on which second connection points 54 are formed. The frame layer 56 is arranged on the top end face 48 of the substrate 46. A chamber 58 is defined between the substrate 46 and 10 the frame layer 56. The photosensitive chip 60 is arranged within the chamber 58, and electrically connected the first connection points 52 by wires 62. The transparent layer 64 is a piece of glass, which is adhered onto the frame layer 56 and is for encapsulating the photosensitive chip 60 and the wires 62.

Next, a lens holder 42 is provided. The lens holder 42 is formed with a 15 chamber 66, and has an internal thread 68 formed on an inner wall of the lens holder 42 so that the transparent layer 64 of the image sensor package 40 is arranged under the lens holder 42.

Then, a lens barrel 44 is provided and is inserted into the chamber 66 of the lens holder 42, and is formed with an external thread 70, which is screwed to the 20 internal thread 68 of the lens holder 42. The lens barrel 44 is formed with an opening 72, a hole 74 communicating with the opening 72, a first positioning slot 80 for directly positioning and holding an aspheric lens 76 and a second positioning slot 82, disposed under the first positioning slot 80, for directly positioning and holding an infrared filter 78. The lens barrel 44, the aspheric lens 25 76 and the infrared filter 78 are integrally formed by way of injection molding. Thus, the lens barrel 44 is integrally formed with the opening 72, the hole 74, the first positioning slot 80 and the second positioning slot 82, and circumferential walls of the hole 74 and the opening 72 are made of the same material. In this case, the lens barrel 44 and the aspheric lens 76 are combined together when the 30 injection molding is being performed.

Please refer to FIG. 3, which is a second schematic illustration showing the

image sensor module of the invention. The transparent layer 64 of the image sensor package 40 is another infrared filter 78. The infrared filter 78 of the lens barrel 44 may be omitted.

5 The image sensor module of the invention, in which the lens barrel 44, the aspheric lens 76 and the infrared filter 78 are integrally formed by way of injection molding, has the following advantages.

The image sensor module is capable of being precisely positioned to facilitate the manufacturing processes.

While the invention has been described by way of an example and in terms 10 of a preferred embodiment, it is to be understood that the invention is not limited to the disclosed embodiment. To the contrary, it is intended to cover various modifications. Therefore, the scope of the appended claims should be accorded the broadest interpretation so as to encompass all such modifications.